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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/684,802	10/15/2003	Johna Leddy	092490-0179	1694

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EXAMINER	
ALEJANDRO, RAYMOND	

ART UNIT	PAPER NUMBER
1727	

MAIL DATE	DELIVERY MODE
06/24/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/684,802	LEDDY ET AL.	
	Examiner	Art Unit	
	RAYMOND ALEJANDRO	1727	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 April 2011*.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4 and 6-75* is/are pending in the application.
  4a) Of the above claim(s) *7-38,41-47,55 and 57-72* is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-4, 6, 39-40, 48-54, 56 and 73-75* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☒ The drawing(s) filed on *15 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.
  Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
  Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  a)☐ All b)☐ Some * c)☐ None of:
    1.☐ Certified copies of the priority documents have been received.
    2.☐ Certified copies of the priority documents have been received in Application No. _____.
    3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
  * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
  Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
  Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04/22/11 has been entered.

This action responds to the amendment accompanying the aforementioned RCE. Applicant's amendment has failed to satisfactorily overcome the rejections under Section 103. Refer to the abovementioned amendment for specific details on applicant's rebuttal arguments and remarks. Therefore, all pending claims are again rejected over the same grounds of rejection as postulated hereunder on the written record:

Election/Restrictions

1. Claims 7-38, 41-47, 55 and 57-72 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 02/23/06.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-3, 4, 6, 39-40, 48, 54 and 73-75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voss et al 5441819 in view of Dhar 5242764.

The present claims are directed to a self-hydrating membrane electrode assembly wherein the disclosed inventive concept comprises the specific water passing characteristic thereof.

As to claims 1 and 75:

Voss et al disclose a membrane electrode assembly 11 comprising an electrolyte in the form of a solid polymer ion exchange membrane 12 disposed between a pair of conductive electrode sheets (COL 7, lines 14-23). A solid polymer ion exchange membrane disposed between the anode and the cathode for facilitating migration of hydrogen ions from the anode to the cathode and wherein the membrane is permeable to water (COL 3, lines 45-50). Water accumulated at the cathode is drawn by a concentration gradient toward the anode across the membrane and is absorbed as water vapor into the hydrogen containing gas supply (COL 3, lines 50-60).

It is disclosed that the electrochemical fuel cell comprises an anode having a catalyst associated therewith for producing hydrogen ions from a hydrogen containing gas supply; a cathode having a catalyst associated therewith for producing anions from an oxygen containing gas supply (COL 3, lines 30-45).

Examiner's note: *it is noted that sufficient water is produced at the cathode side as a result of the electrochemical reaction occurring thereon and such water is sufficient to maintain a satisfactory level of hydration in the anode.*

Voss et al further disclose the incorporation of additional ingredients into the electrodes, those ingredients are hydrophobic polymers such as Teflon brand polytetrafluoroethylene and/or a dispersing agent Teflon 30B (COL 7, lines 49-60). *It is contended that the disclosed additional ingredients are capable of imparting ion conductivity thereto.*

Voss et al further disclose the incorporation of additional ingredients into the electrodes, those ingredients are hydrophobic polymers such as Teflon brand polytetrafluoroethylene and/or a dispersing agent Teflon 30B (COL 7, lines 49-60). *It is contended that the disclosed additional ingredients are capable of imparting ion conductivity thereto.*

Voss et al disclose that is known to use a perfluorosulfonic ion exchange membrane such as Nafion as the electrolyte membrane (COL 7, lines 24-28). *Furthermore, given that the layer of catalytic material is in direct contact with the electrolyte membrane, it is contended that mixing of catalytic material and electrolyte membrane occurs at the interface formed therebetween. Thus, the catalytic material contains such electrolyte membrane at least at the interface.*

As to claims 2-3:

Voss et al use Pt as a catalytic material (COL 7, lines 60-65). Disclosed is that each carbon fiber paper sheet for operation as the anode 20 and cathode 22 uses Pt (COL 7, lines 60-64).

As to claim 6:

Voss et al further disclose the incorporation of additional ingredients into the electrodes, those ingredients are hydrophobic polymers such as Teflon brand polytetrafluoroethylene and/or a dispersing agent Teflon 30B (COL 7, lines 49-60). *It is contended that the disclosed additional ingredients are capable of imparting ion conductivity thereto.*

Voss et al disclose that is known to use a perfluorosulfonic ion exchange membrane such as Nafion as the electrolyte membrane (COL 7, lines 24-28). *Furthermore, given that the layer of catalytic material is in direct contact with the electrolyte membrane, it is contended that mixing of catalytic material and electrolyte membrane occurs at the interface formed therebetween. Thus, the catalytic material contains such electrolyte membrane at least at the interface.*

As to claims 39-40:

Voss et al disclose that is known to use a perfluorosulfonic ion exchange membrane such as Nafion as the electrolyte membrane (COL 7, lines 24-28).

As to claims 48:

Voss et al disclose that membrane 12 may have a thickness of about 0.01 inches or less because it has been found that thinner membranes significantly improve fuel cell efficiency (COL 7, lines 28-32). *It is noted that 0.01 inches is equivalent to 10 mil.*

As to claim 54:

The reaction of Voss involves the flux of reactants such as fuel gas and oxidant gas (COL 3, lines 30-49). *Absent further specific material description from the claim, it is contended that the flow and/or flux of reactant materials satisfy the claimed requirement.*

Voss discloses a membrane electrode assembly as set forth supra. However, the preceding prior art reference fails to expressly disclose the ion conducting material and the specific separator/cathode/anode/catalyst configuration.

As to claims 1 and 73-75:

Dhar discloses solid polymer fuel cells wherein a proton conducting material is deposited as the electrolyte on top of the catalytic side of the electrodes acting as the anode and cathode (ABSTRACT). The electrodes have deposits of solid electrolyte thereon (COL 4, lines 8-14). Note that the fuel cell of Dhar requires no additional humidification (COL 6, lines 16-18 & lines 42-44). *Thus, it can be said that it is self-hydrated.*

(**Emphasis added→**) In addition, Dhar discloses first and second electrolyte deposits placed on respective first and second electrodes, and an electrolyte membrane positioned between and in contact with the first and second electrolyte deposits, and the membrane having a central hole (**CLAIM 1 and FIGURE 2**). *This accounts for applicant's limitation requiring the presence of a mixture of electrode catalyst and an ion conducting material.*

(**Emphasis added→**) With respect to the specific separator/cathode/anode/catalyst configuration:

FIGURE 2 of Dhar displays an embodiment including a slightly oversized solid electrolyte membrane, positioned between and in contact with the electrolyte deposits 22 and 24 with the central part cut out; and examples of suitable membranes include NAFION and any other proton exchange membrane suitable for solid polymer fuel cell work (COL 5, lines 42-58). *Therefore, it is contended that the polymer electrolyte membrane separator includes portions contacting the anode and the cathode without contacting respective catalyst layers on the anode and the cathode sides.*

PRIOR ART STRUCTURE:

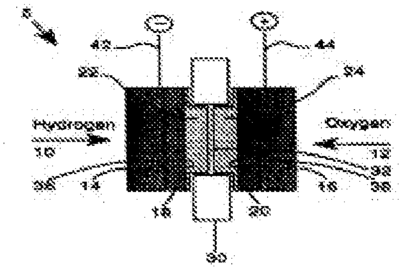

Fig. 2

Applicant's apparent structure (FIGURE 2):

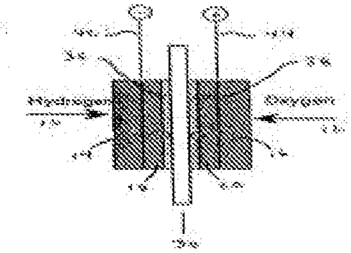

FIGURE 2

Concerning claim 4:

Dhar also discloses that the hydrogen electrode catalyst is Pt and the oxygen electrode catalyst is another oxygen reducing catalyst such as a macrocyclic chelate compound (COL 4, lines 50-59).

In view of the above, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the catalytic material comprising the ion conducting material of Dhar in the membrane electrode assembly of Voss et al as Dhar discloses that a proton conducting material deposited as the electrolyte on top of the catalytic side of the electrodes acting as the anode and cathode serves to separate the anode from the cathode. Thus, Dhar provides specific guidance that ion conducting materials incorporated in electrode catalyst material are helpful to further separate the anode side of the fuel cell from the cathode side thereof, thereby avoiding detrimental or catastrophic damages to the fuel cell.

In view of the above, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the different catalyst materials in the anode and cathode (the cathode catalyst and the anode catalyst are not the same) of Voss et al because Dhar teaches that, in fuel cells, an anode and a cathode use different catalyst materials to improve fuel cell performance. Thus, Dhar directly teaches the use of an anode catalyst which is different from the cathode catalyst.

With respect to the specific separator/cathode/anode/catalyst configuration, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to make Voss's membrane electrode assembly by having the specific separator/cathode/anode/catalyst configuration of Dhar as Dhar expressly teaches that the purpose of the oversized membrane configuration is for gasketing the perimeter of the electrodes and preventing reactant cross-over around the electrodes, thereby enhancing the performance of membrane electrode assembly in the fuel cell.

4. Claims 1-3, 6, 39-40, 48, 54 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voss et al 5441819 in view of Biegert et al 2004/0241531.

As to claim 1:

Voss et al disclose a membrane electrode assembly 11 comprising an electrolyte in the form of a solid polymer ion exchange membrane 12 disposed between a pair of conductive electrode sheets (COL 7, lines 14-23). A solid polymer ion exchange membrane disposed between the anode and the cathode for facilitating migration of hydrogen ions from the anode to the cathode and wherein the membrane is permeable to water (COL 3, lines 45-50). Water accumulated at the cathode is drawn by a concentration gradient toward the anode across the membrane and is absorbed as water vapor into the hydrogen containing gas supply (COL 3, lines 50-60).

It is disclosed that the electrochemical fuel cell comprises an anode having a catalyst associated therewith for producing hydrogen ions from a hydrogen containing gas supply; a cathode having a catalyst associated therewith for producing anions from an oxygen containing gas supply (COL 3, lines 30-45).

Examiner's note: *it is noted that sufficient water is produced at the cathode side as a result of the electrochemical reaction occurring thereon and such water is sufficient to maintain a satisfactory level of hydration in the anode.*

Voss et al further disclose the incorporation of additional ingredients into the electrodes, those ingredients are hydrophobic polymers such as Teflon brand polytetrafluoroethylene and/or a dispersing agent Teflon 30B (COL 7, lines 49-60). *It is contended that the disclosed additional ingredients are capable of imparting ion conductivity thereto.*

Voss et al further disclose the incorporation of additional ingredients into the electrodes, those ingredients are hydrophobic polymers such as Teflon brand polytetrafluoroethylene and/or a dispersing agent Teflon 30B (COL 7, lines 49-60). *It is contended that the disclosed additional ingredients are capable of imparting ion conductivity thereto.*

Voss et al disclose that is known to use a perfluorosulfonic ion exchange membrane such as Nafion as the electrolyte membrane (COL 7, lines 24-28). *Furthermore, given that the layer of catalytic material is in direct contact with the electrolyte membrane, it is contended that mixing* *of catalytic material and electrolyte membrane occurs at the interface formed therebetween. Thus, the catalytic material contains such electrolyte membrane at least at the interface.*

As to claims 2-3:

Voss et al use Pt as a catalytic material (COL 7, lines 60-65). Disclosed is that each carbon fiber paper sheet for operation as the anode 20 and cathode 22 uses Pt (COL 7, lines 60-64).

As to claim 6:

Voss et al further disclose the incorporation of additional ingredients into the electrodes, those ingredients are hydrophobic polymers such as Teflon brand polytetrafluoroethylene and/or a dispersing agent Teflon 30B (COL 7, lines 49-60). *It is contended that the disclosed additional ingredients are capable of imparting ion conductivity thereto.*

Voss et al disclose that is known to use a perfluorosulfonic ion exchange membrane such as Nafion as the electrolyte membrane (COL 7, lines 24-28). *Furthermore, given that the layer of catalytic material is in direct contact with the electrolyte membrane, it is contended that mixing of catalytic material and electrolyte membrane occurs at the interface formed therebetween. Thus, the catalytic material contains such electrolyte membrane at least at the interface.*

As to claims 39-40:

Voss et al disclose that is known to use a perfluorosulfonic ion exchange membrane such as Nafion as the electrolyte membrane (COL 7, lines 24-28).

As to claims 48:

Voss et al disclose that membrane 12 may have a thickness of about 0.01 inches or less because it has been found that thinner membranes significantly improve fuel cell efficiency (COL 7, lines 28-32). *It is noted that 0.01 inches is equivalent to 10 mil.*

As to claim 54:

The reaction of Voss involves the flux of reactants such as fuel gas and oxidant gas (COL 3, lines 30-49). *Absent further specific material description from the claim, it is contended that the flow and/or flux of reactant materials satisfy the claimed requirement.*

Voss discloses a membrane electrode assembly as set forth supra. However, the preceding prior art reference fails to expressly disclose the specific configuration of separator/cathode/anode/catalyst and the specific amount of the catalytic component.

As to claim 1:

Biegert et al discloses solid polymer fuel cells wherein a polymer electrolyte membrane material is a proton conducting material contacts catalytic side of the electrodes acting as the anode and cathode (0022-0024; FIGURE 1). The electrodes have deposits of solid electrolyte thereon (COL 4, lines 8-14). Note that the fuel cell of Biegert et al discloses that as a result of the interaction between cathode 7 and anode 6 the MEA 1, a mass flow from the cathode to the anode develops which guarantees an adequate humidification of the electrolyte 5 (0020) and/or water concentration gradients (0024). *Thus, it can be said that it is self-hydrated.* (**Emphasis added→**) In addition, Biegert et al discloses that both the anode and the cathode can include additional conducting materials such as fluorinated polymers (0022 & 0024) admixed with catalyst materials (0022 & 0024). *This accounts for applicant's limitation requiring the presence of a mixture of electrode catalyst and an ion conducting material.*

(**Emphasis added→**) With respect to the specific separator/cathode/anode/catalyst configuration:

FIGURE 1 of Biegert et al displays an embodiment including a polymer electrolyte membrane 5 arranged between electrodes 6 and 7 including catalyst materials 4 (0018 & FIGURE 1) wherein the polymer electrolyte membrane extends beyond the end portions of ALL other membrane electrode assembly components (FIGURE 1); and the polymer electrolyte is based on Nafion which is an ion conducting material (0023). *Therefore, it is contended that the polymer electrolyte membrane separator includes portions contacting the anode and the cathode without contacting respective catalyst layers on the anode and the cathode sides.*

PRIOR ART STRUCTURE:

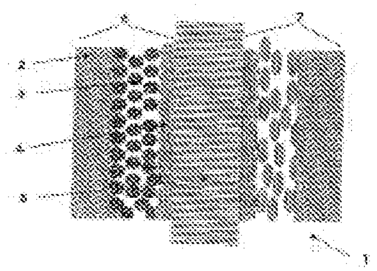

Fig. 1

Applicant's apparent structure (FIGURE 2):

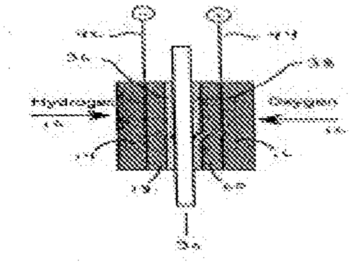

FIGURE 2

As to claim 56:

Biegert et al disclose that is known to use catalyst materials with a degree of loading between (*in the amount of*) 0.4 mg/cm^2 and 4 mg/cm^2 in membrane electrode assemblies for self-humidifying fuel cells (P. 0026 & 0018).

In this case, it is noted that, at least, the end point (i.e. 0.4 mg/cm^2) constitutes a valid data point and thus it full encompasses the claim as the end point represents a specific disclosure of a discrete embodiment of the invention disclosed by the prior art which amounts to a complete *description and, therefore, an anticipation of the claimed range.* ***See Ex Parte Lee 31 USPQ2d 1105***.

In view of the above, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to make Voss's membrane electrode assembly by having the specific separator/cathode/anode/catalyst configuration of Biegert et al as Biegert et al expressly teaches that as a result of the interaction between the membrane electrode assembly and the cathode and anode a mass flow from the cathode to the anode develops which guarantees an adequate humidification of the electrolyte. Thus, the specific separator/cathode/anode/catalyst configuration of Biegert et al serves the purpose of enhancing humidification within the fuel cell to avoid dehydration of the polymer electrolyte which can affect the performance of the fuel cell.

With respect to the specific amount of catalytic component, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the specific amount of the catalytic component of Biegert et al in the membrane electrode assembly of Voss et al and/or Voss et al-Dhar because Biegert et al discloses that such specific catalyst amount improves current/voltage characteristics of the membrane electrode assembly using the same. As such, the performance of the membrane electrode assembly is improved.

5. Claims 49-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voss et al 5441819 in view of Dhar 5242764 as applied above to claim 39.

The teachings of Voss et al, alone or in combination with Dhar as seen supra are incorporated herein by reference. However, the preceding references do not expressly disclose the specific thickness of membrane as recited in claims 49-53.

As to claims 49-53:

Voss et al disclose that membrane 12 may have a thickness of about 0.01 inches or less because it has been found that thinner membranes significantly improve fuel cell efficiency (COL 7, lines 28-32). *It is noted that 0.01 inches is equivalent to 10 mil.*

In view of the above, it would have been obvious to a person possessing an ordinary level of skill in the pertinent art to make the membrane of Voss et al by the specific thickness of membrane as recited in claims 49-53 because Voss et al directly teach that membrane 12 may have a thickness of about 0.01 inches or less because it has been found that thinner membranes significantly improve fuel cell efficiency. Thus, Voss et al mention that membranes with a thickness of less than 0.01 inches (10 mil) are also desirable for the benefit of improving the efficiency of the fuel cell. In this case, a prima-facie case of obviousness does exit because Voss et al suggest to further reduce the thickness of the electrolyte membrane for specific purposes as those mentioned above. Therefore, Voss et al directly teach the use of a thickness within the claimed range. (***See In re Geisler, 116 F.3d 1465, 1469-71, 43 USPQ2d 1362, 1365-66 (Fed. Cir. 1997***). ***See also MPEP 2144.05 [R-3] Obviousness of Ranges.***

6. Claim 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over Voss et al 5441819 in view of Dhar 5242764 as applied above to claim 2 and further in view of Biegert et al 2004/0241531.

The teachings of Voss et al, alone or in combination with Dhar as seen supra are incorporated herein by reference. However, the preceding references do not explicitly disclose the specific amount of the catalytic component.

Biegert et al disclose that is known to use catalyst materials with a degree of loading between (*in the amount of*) 0.4 mg/cm^2 and 4 mg/cm^2 in membrane electrode assemblies for self-humidifying fuel cells (P. 0026 & 0018).

In this case, it is noted that, at least, the end point (i.e. 0.4 mg/cm^2) constitutes a valid data point and thus it full encompasses the claim as the end point represents a specific disclosure of a discrete embodiment of the invention disclosed by the prior art which amounts to a complete description and, therefore, an anticipation of the claimed range. ***See Ex Parte Lee 31 USPQ2d 1105.***

In view of the above, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the specific amount of the catalytic component of Biegert et al in the membrane electrode assembly of Voss et al and/or Voss et al-Dhar because Biegert et al discloses that such specific catalyst amount improves current/voltage characteristics of the membrane electrode assembly using the same. As such, the performance of the membrane electrode assembly is improved.

Response to Arguments

7. Applicant's arguments filed 04/22/11 have been fully considered but they are not persuasive.

8. (NEW) Applicant has contended that none of the cited references fairly teach or suggest "*a separator with a portion contacting the anode and cathode but not contacting catalytic materials*". In reply, the examiner contends that applicant appears to overlook that Voss' carbon fiber sheet is a POROUS carbon based material (COL 7, lines 33-45) having deposited thereon a

coating or layer of catalytic material (COL 7, lines 33-65). Thus, in this case, it should be noted that the porosity or the pores in the carbon-based sheet creates an irregular surface pattern in which the catalytic material layer/coating may not be uniformly and integrally formed over the entire porous surface of the carbon-based sheet. Therefore, it is not unreasonable to state that a portion of Voss's electrode structure having its porous surface irregularly coated with catalyst material and contacting the separator has, indeed, portions or zones or regions or areas or points in or around the pores (porous areas) where the catalytic material layer does not entirely cover the intended-coated surface of the electrode structure so that it (the electrode structure) may have gaps equivalent to applicant's portions in which the anode and cathode structure contacts the separator while also having majority of electrode's surface areas coated with catalytic materials which are contacting the separator as well.

One critical point here is that, in the examiner's opinion, the porous carbon-based materials provide the necessary porous structure to assert that irregular and non-integral patterns of catalyst coating layer may be formed on the surface thereof, thereby creating gaps in the electrode structure which remain uncoated with catalytic material (i.e. bare electrode surface) and contact the separator.

Another critical point is that the present claims recite “portion”, and hence, do not specifically define how much specific surface area of the cathode-separator interface, anode-separator interface, catalytically coated cathode-separator interface and catalytically coated anode-separator interface applicant refers to as the claimed "portion". Because the particular sizes of ALL of the above interfaces are not specifically defined in the present claims, ANY point of contact between uncoated surfaces of the electrode and the separator constitutes a "contact" portion regardless of its/their dimension(s).

One more critical point, it should be noted that while applicant's claim language recites "contacting" or the like, it does not call for "directly contacting" or "physically contacting" or "in direct contact" or "in physical contact" or variants thereof or similar language. Therefore, it is not unsuitable to set forth that the cathode-separator contact and the anode-separator contact of Voss still read on applicant's cathode separator contact portions or anode-separator contact portions as there are zones or regions or parts in Voss' cathode-separator indirect contact zones and anode-separator indirect contact zones which also promote electrical contact therebetween or provide operative contact. Thus, they are all in electrical contact or operative contact although they might not necessarily be in "physical contact" or "direct contact". Thus, because applicant's invention does not describe the type of contact between ALL those elements, any kind of contact is possible.

9. (NEW) In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies [i.e., i)"*these catalytic material layers cover less than the entire facing surface of the anode and cathode*"; and/or ii) "*the separator directly contact either the anode or cathode*"] are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

10. In connection with the discussion supra (i.e. applicant's arguments against the 103 rejection of Voss et al in view of Dhar), applicant has contended that "*Voss and Dhar, alone or*

in combination, fail to describe, teach or suggest...a separator with a portion that contacts the anode and cathode but does not contact the catalytic materials thereon" and "*dispersing at least one ion conducting material throughout the layer of catalytic material*".

In response to the first argument, it should be noted that Dhar shows applicant's specific separator/cathode/anode/catalyst configuration. For instance, **FIGURE 2** of Dhar displays an embodiment including a slightly oversized solid electrolyte membrane, positioned between and in contact with the electrolyte deposits 22 and 24 with the central part cut out; and examples of suitable membranes include NAFION and any other proton exchange membrane suitable for solid polymer fuel cell work (COL 5, lines 42-58). Therefore, it is contended that the polymer electrolyte membrane separator includes portions contacting the anode and the cathode without contacting respective catalyst layers on the anode and the cathode sides.

PRIOR ART STRUCTURE:

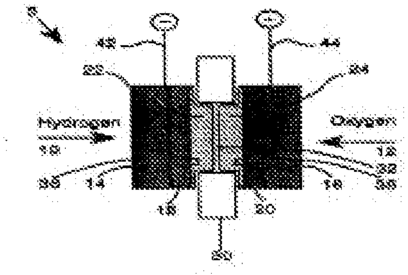

Fig. 2

Applicant's apparent structure (FIGURE 2):

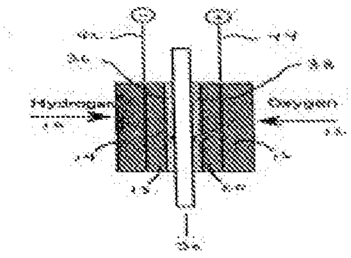

FIGURE 2

Therefore, the examiner sees insubstantial structural differences between the separator/cathode/anode/catalyst configuration of Applicant and that of the PRIOR ART. Applicant is kindly reminded that a recitation of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. Also, if the prior art structure is capable of performing the intended use, then it meets the claim.

In response to the second, it should be further noted that Dhar discloses and claims first and second electrolyte deposits placed on respective first and second electrodes, and an electrolyte membrane positioned between and in contact with the first and second electrolyte deposits, and the membrane having a central hole (CLAIM 1 and FIGURE 2). This accounts for applicant’s limitation requiring the presence of a mixture of electrode catalyst and an ion conducting material. Concerning this matter, applicant’s limitation “dispersed throughout the layer of catalytic material” has not been construed as "uniformly mixed" and/or "intimately mixed" and/or "admixed" and/or "forming an admixture" or any other variant. Indeed, it has been taken to refer to multiple points of the catalytic material including along its periphery.

11. With respect to other miscellaneous issues raised by the applicant, in general, the examiner avers that applicant’s ion conducting material is materially undefined, that no specific ion conduction degree is required in the present claims to at least provide a minimum distinction between the disclosed material and the claimed material; that the specification as-filed failed to explicitly define "an ion conducting material" (as admitted on record by the applicant, see paragraph bridging pages 12-13 of the 06/04/09 amendment); that applicant's "ion conducting material" encompasses or covers a large number of materials, or a plethora of substances, or a infinite quantity of conductive materials; that applicant has not provided any objective, scientific or sound evidence to demonstrate that the disclosed ion conducting material (i.e. Teflon as advanced by the office action) is 100 % incapable of conducting or transporting ion at its microstructure or lattice arrangement or that it is totally impossible for Teflon to conduct or transport any minimal amount of ions or few ions. A review of applicant’s Appendix evidence merely reveals in item c that "*Unlike Teflon, Nafion is highly ion-conductive. It functions as a*

cation exchange polymer". However, there is no further evidence from reading the Appendix that Teflon cannot transport or conduct ions at all. Indeed, the fact that the evidence submitted by the Applicant (the Appendix) reveals that Nafion is highly ion-conductive is sufficient to establish that Teflon is NOT highly ion-conductive but insufficient to establish that Teflon cannot transport ions or is fully incapable of performing such a transport phenomenon. Not being a highly ion-conductive material does not necessarily mean that it cannot conduct or transport ions at all. Ion conduction or transport can take place at different practical levels including but not limited to: low conduction (poor), medium conduction (moderate), or high conduction, and it is not unreasonable to state that any one of foregoing ion conduction/transport levels reads on "ion conducting" as instantly claimed, especially in view of lack of materially defined constituents or specifically defined degree of conduction or anything that distinguishes a poor/moderate ion conducting material from a highly ion-conductive material as argued but not claimed by the applicant. With all that said, it is contended that although Teflon is not a highly ion-conductive material as preferred but unclaimed by the applicant, it does possess a limited ability to conduct ions. As such, it is an ion conducting material with a limited ability to conduct or transport ions.

If applicant insists on this issue, and is still fully convinced that Teflon cannot transport ions at all and/or that Teflon is 100% incapable of moving/conducting ions, then, it cannot be difficult for the applicant to find credible technical literature or scientific evidence stating so, that is, that Teflon *does not* transport ions, *cannot* conduct ions, or is *incapable* of transporting ions at all. Until such literature or evidence be submitted for consideration, the present claims will remain rejected as formulated supra.

12. With respect to the point that mixing necessarily occurs at the interface in Voss' assembly, the examiner's position remains unchanged, and thus, the examiner stands by his previous arguments. The examiner likes to add that there is no clear definition in the present claims of the boundaries of each component and/or the structural interrelationship between those membrane electrode assembly components to set forth an unambiguous separation or lack of interdependency between ALL the claimed components. As such, the degree of interaction between ALL the membrane electrode assembly components or their respective structural cooperative relationship are sufficiently unspecified, therefore, it cannot be ignored, let alone disregarded, that ALL the membrane electrode assembly components are stacked or laminated together, are interacting between them, are in direct physical contact to each other to the point that direct material interaction, and/or material dissociation and penetration does occur at the interface, and when such interaction or dissociation takes place at the interface, the interface itself becomes an active region in which a mix of all those elements and materials is present, thereby creating the synergistic effect that they all share each of the properties or characteristics of each material. To that effect, in this case, the interaction of the Nafion membrane with the electrode aspect in Voss does provide an interfacing region exhibiting effective electrode catalytic behavior but at the same time effective ion conductive properties due to the interaction of the catalytic electrode materials and the polymer exchange material. The examiner cannot find any other way to better explain this matter.

(**Emphasis supplied**) It bears noting that the materially undefined ion-conducting material of the applicant covers a very large number of applicable materials which can be used therefor. As a result, it is strenuously contended that ANY material exhibiting certain degree of ion conduction added to each respective electrode would produce a cathode or an anode exhibiting the specific ion conducting property.

13. With respect to the rejections under the 103 statutes: in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies [i.e., i) applicant's discussion and comparison of Nafion with Teflon {paragraph bridging pages 12-13}, the present claims are wholly silent about the particular ion conducting material; ii) applicant's discussion of mixing the catalyst with a solution of Nafion or that the electrodes are coated with separate layers of a catalyst and a proton conducting material {page 17, item 1.}] are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Thus, applicant's arguments are not commensurate in scope with the presently claimed invention.

14. With respect to the rejection under the 103 statute: in response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, applicant is reminded that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. (***Emphasis added***) Rather, the test is what the

combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

In this case, it is noted that secondary reference Dhar is pertinent to the primary reference Voss as well as the field of applicant's endeavor as Dhar addresses the same problem of providing a membrane electrode assembly with a suitable degree of ion-conduction for obtaining a working fuel cell assembly once the membrane electrode assembly is integrated into fuel cell assembly. It is imperative to note that the teachings of Dhar are sufficient to show that a skilled artisan would clearly recognize that the addition of the ion-conducting material in the electrode component of Dhar to the electrode component of Voss would produce an electrode(s) exhibiting enhanced ion-conduction properties, thereby improving the efficient and capability of the fuel cell assembly as a whole. All the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention. Stated differently, combining prior art elements according to known methods to yield predictable results is prima-facie obvious. **KSR International Co. v. Teleflex Inc., 550 US- 82 USPQ2d 1385, 1396 (2007)**. Thus, it would have been within the skill of an artisan to modify the electrode components of Voss as effectively disclosed by Dhar, and such a modification would have improved the capability and efficiency of the membrane electrode assembly in the fuel cell rather than negatively affecting or causing detrimental effects to the operation of Voss's fuel cell assembly.

15. With respect to the rejection under the 103 statute: in response to applicant's argument hat "*Voss repeatedly emphasizes that the disclosed membrane electrode assembly includes a*

solid polymer ion exchange membrane in order to isolate the hydrogen-containing gas supply from the oxygen-containing gas supply", that is, "*Voss's assembly already avoids any detrimental or catastrophic damages to its fuel cell by including the disclosed solid polymer ion exchange membrane in the assembly*", the fact that applicant has recognized another advantage or disadvantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

16. With respect to applicant's arguments against Voss et al, applicant has contended that claim 1 requires that "*the catalyst on the surface of the cathode and anode must contain both a catalytic material (such as Pt, Pd, etc.) and an ion conducting material, such as Nafion*"; and that "*Voss does not teach or suggest such a device*". However, nowhere do the present claims recite or require the specific materials as argued by the applicant. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., *a catalytic material (such as Pt, Pd, etc. and/or an ion conducting material, such as Nafion)* are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

17. Thereafter, applicant went to explain that "*TEFLON is not an ion conducting material…TEFLON is widely-recognized as one of the best insulators available in the world today*", consequently, applicant asserts that "*And as an insulator, TEFLON cannot possibly conduct ions*". Well, applicant's assertion may be correct, and there is no dispute about the conductive nature of material called TEFLON. Nevertheless, an analysis of the literal claim

scope, as currently presented or amended, reveals the independent claim 1 requires only the presence of "*at least one ion conducting material*" without clearly specifying the particular degree of ion-conductivity and/or at least suggest that such "ion conducting material" positively promotes ion conduction. While the examiner does not dispute that TEFLON does exhibit a low degree of conductivity, the examiner strenuously avers that Teflon per se is capable of at least conducting few ions, as such, the legal language of the present claim still reads on the applied reference. In other words, even though TEFLON material may lack a micro-structural arrangement providing a suitable mechanism for high degree of ion conductivity, such as to promote conduction; applicant has not demonstrated that TEFLON itself is 100 % incapable of being an ion conductor. Therefore, although its rate of ion conduction is low, such low conductivity still reads on the language of the present claims which only calls for "an ion conducting material" without clearly specifying the requisite degree for conduction.

If applicant can show or demonstrate that TEFLON cannot, by any means, conduct ions or is incapable of conducting ions at all (***←emphasis supplied***) by presenting objective or sound evidence, then all applicable grounds of rejection on this matter will be removed; otherwise, the examiner asserts that the claimed invention, as currently drafted or written, does not overcome the prior art of record. Applicant should understand that a ground of rejection, while being scientifically or technically founded, is also based on a literal analysis of what the scope of a claim is, thereby permitting to fully contemplate all possible permutations consistent with the legal language employed to define the invention at hand and, ultimately, to protect the public from any misinterpretation or misconstruction of the claim language or implicitly claimed subject matter.

18. In response to applicant's argument that "*one in the art would not combine Voss and Dhar in the manner suggested by the Examiner*", the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Applicant has argued that the two references are not combinable because Voss discloses a polymer electrolyte membrane to separate the cathode and the anode, and Dhar discloses the elimination of the polymer electrolyte membrane separator, and in its place, some ion conducting material is incorporated into the electrodes for achieving separation. Well, applicant is overlooking the concept that the specific polymer electrolyte membrane of Voss as well as the "some ion conduction material" of Dhar both serve the same intended purpose and utility of separating the anode and the cathode to prevent the two of them coming into contact. Therefore, Dhar's ion conducting material and the polymer electrolyte membrane of Voss both have the same functionality and they both act as an ionic separator for separating the anode and the cathode and for providing ion transport within the cell. As such, the examiner sees no differences, in term of function and ultimately structure, between the separation element of both references so as to arrive at the conclusion that one reference is not pertinent to the other or that one reference cannot modify the other. The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAYMOND ALEJANDRO whose telephone number is (571)272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara L. Gilliam can be reached on (571) 272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Raymond Alejandro/
Primary Examiner, Art Unit 1795